JOURNAL

OF THE

WASHINGTON ACADEMY OF SCIENCES

VOL. 11 MARCH 4, 1921 No. 5

RADIOTELEGRAPHY.—*The wave front angle in radiotelegraphy.*[1]

L. W. AUSTIN, U. S. Naval Radio Research Laboratory.

One of the outstanding problems in radiotelegraphic transmission is the determination of the angle between the advancing wave front and the earth. A number of physicists[2] have treated the subject theoretically and a resumé of their conclusions may be found in Zenneck's *Wireless Telegraphy* (translation 1915), pp. 246–253. The subject is of great importance in the theory of transmission and has a very practical interest in the reception of signals on ground antennas.

Several experimenters have attempted to measure the wave front angle by means of receiving loops, the method being to rotate the loop around a vertical axis to the point of minimum signal and then to rotate again around a horizontal axis in the plane of the wave front until silence is obtained. A little consideration will show that this method is not applicable to the problem, since after the minimum is obtained by rotation about the vertical axis, none of the magnetic lines of the wave can thread the loop no matter what its angle in reference to the wave front, any residual effect in this position being due to the action of the loop as an antenna.

The most obvious method for measuring the angle, and the one which seems most free from objection, makes use of a pivoted straight wire antenna system well elevated above the ground with a receiver inserted in the middle. The general arrangement is shown in figure 1, and the method of shielding the circuits in figure 2. The antenna consists of two collector wires, each 30 feet long, supported on a pivoted wooden spreader (Fig. 1) 60 feet long, mounted at the top of a 55 foot wooden pole so as to be capable of rotation about a hori-

[1] Received December 20, 1920.

[2] J. ZENNECK, Ann. Phys. **23**: 846. 1907. K. ULLER, Jahrb. **2**: 8. 1908. A. SOMMERFELD, Ann. Phys. **28**: 665. 1909. P. EPPSTEIN, Jahrb. **4**: 176. 1910.

zontal as well as a vertical axis. The receiving set consists of a primary inductance and parallel capacity connected between the two collectors as shown in figure 2, and a secondary, generally of the magnetic back-coupled oscillating vacuum tube type, provided with a two-stage audio frequency amplifier, though in some experiments a radio-audio amplifier with heterodyne was used. The whole set including the batteries was mounted on top of the pole.

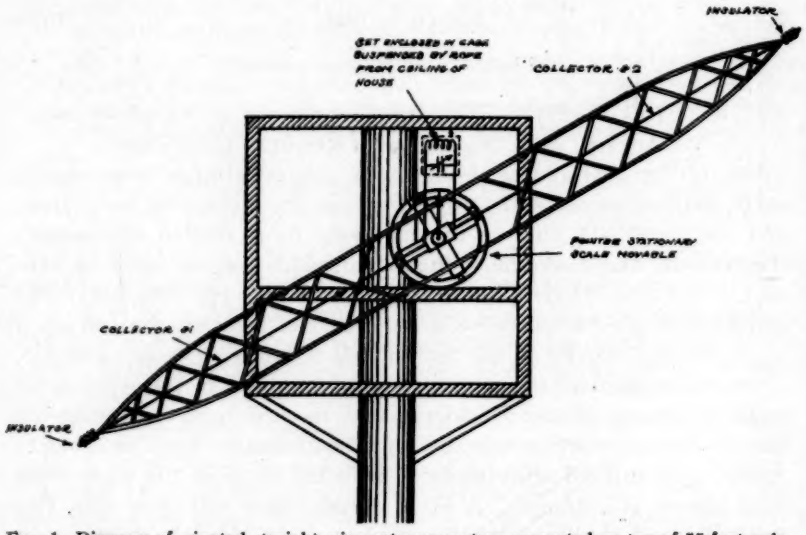

Fig. 1. Diagram of pivoted straight wire antenna system, mounted on top of 55 foot pole.

The method of experiment is as follows. The antenna is first set vertical with the horizontal axis approximately in the plane of the wave front. This gives maximum signal. It is then rotated about the horizontal axis and as the antenna approaches the horizontal position the signal fades as on an ordinary radio compass. At some angle it dies out, and then as the rotation is continued comes in again. At the mean of the two positions of just audible signal, the antenna is perpendicular to the wave front if there are no causes of distortion. The antenna is next rotated through 180 degrees and two more angles of disappearing signal are observed. The mean of the four observations should give the determination with considerable accuracy.

In the final experiments the mast with its pivoted antenna and instruments was erected on the Anacostia Flats not far from the Washington Navy Yard. The absence of wire lines and houses within

a distance of more than a quarter of a mile made this an ideal location for the work. The two collector wires of the antenna were stretched in a straight line by the spreader shown in figure 1. This was constructed of wood with its joints fastened by wood dowel pins and a few brass screws. The scale for determining the angle was aligned with the wires by means of a transit. All the apparatus, with the exception of the primary inductance and condenser, was contained in a box covered with fine mesh copper screen. This box was supported by ropes in order to reduce the capacity between the receiving set and the mast. It was also found necessary to shield the telephone leads and ground the head band to the copper screen surrounding the apparatus.

At first a certain asymmetry was observed in the reading when the antenna was turned through 180 degrees. This was apparently due to an asymmetry in the capacity between the grounded shield and the two collector wires, and was corrected by connecting a small compensating condenser between one side of the primary and the shield. This condenser also produced a much sharper minimum. Its action is similar to that of the compensating condenser frequently used with the ordinary radio compass. Figure 2 shows the method of coupling the primary to the secondary, the magnetic field passing with some loss through the shield while the static field is cut off. The primary and compensating condensers were supported by cords in order to reduce the capacity between them and the mast. The antenna collectors and all the instruments were thoroughly insulated. The reversing switch in the primary in figure 2 allowed the collectors to be reversed without actually turning the antenna through 180 degrees. With strong signals it was necessary to turn the primary coil parallel to the plane of the oncoming wave and correctly adjust the compensating condenser in order to prevent the signals being heard with the collectors disconnected. This precaution is of importance, since any signal picked up by the instruments not only blurs the minimum but displaces it.

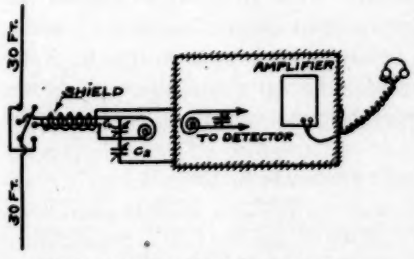

Fig. 2. Method of shielding circuits.

It was originally intended to continue the observations for several months so as to make an extended series of measurements on stations

lying in different directions, at different times of day and different seasons of the year. Preliminary observations had been made at the Bureau of Standards in the summer and autumn of 1919, using a lower pole, shorter collectors and less efficient screening, so that the possible errors of observation at that time were not much less than 10 degrees. During this time a large number of observations were made on various stations including New Brunswick, Annapolis, Nauen, Lyons, San Juan and Darien, but in no case were any deviations of the wave front from the vertical found which were greater than the estimated errors of observation. The work with the final apparatus at Anacostia had been in progress only a short time when it became necessary to remove the pole as it was considered dangerous to the aviators at Bolling Field.

Daylight observations

The results obtained during this period are given below. While they are not as extensive as would be desirable, they probably fix a definite limit to the deviations of the wave front from the vertical for the stations measured, under conditions of normal daylight reception. A great number of measurements were made on the near-by stations, New Brunswick and Annapolis, largely as a test of the accuracy of the apparatus, as it was assumed that the wave front at these distances would be practically vertical. New Brunswick showed an apparent bending forward of the wave front amounting to 3.1°, while Annapolis showed an apparent bending back amounting to 2.2°. These apparent deviations are considered as probably due to systematic errors of the apparatus, depending apparently on the direction of the horizontal axis.

TABLE 1. WAVE FRONT ANGLES, JUNE, 1920

Station	Distance in nautical miles	Wave length in meters	Apparent angle of wave front mean	Number of sets of observations	Maximum deviation of any set from mean
New Brunswick	152	13,000	+3.1[a]	44	+1.4°
Annapolis	29	17,200	−2.2°	14	+1.2°
Nauen	3595	12,500	+3.4°	3	−0.4°
San Diego	1974	15,200	−0.8°	1	+1.3°

[a] The plus sign indicates a forward sloping wave front.

The chief interest in the experiments was of course centered in observations on stations at a great distance. A number of observations were made on Nauen of which the average is given in table 1. It is seen that the deviation from the vertical is only slightly greater than the estimated error. On one day measurements were also obtained on San Diego. This observation is of especial interest because

in this case the waves passed over land for the whole distance, which might be expected to produce a marked tilt in the wave front. The table shows, however, that the wave front according to the observations is almost exactly vertical.

Night observations

On account of the well known shift of the apparent direction of New Brunswick as observed in Washington at night, an attempt was made to discover whether there was a similar shift in the angle of the wave front. This was of interest since the most usual explanation of the apparent shift in direction assumes the arrival at the receiving station of a portion of the energy by reflection from the upper atmosphere. During the observations in the autumn of 1919 with the preliminary apparatus, experiments were carried on throughout one night, while at the same time the apparent deviation in the direction of New Brunswick was observed on the radio compass. No certain deviation of the wave front was found, while the apparent direction of the station shifted at times by as much as 30°. Observations were also made every ten minutes from 5.45 p. m. to 11.45 p. m. on June 14, using the final apparatus, but no certain deviation in the wave front angle was observed at any time.

Comparison of the vertical and horizontal intensities of the wave

The problem of the wave front angle may be attacked in another way. If we are able to measure the received currents from a distant station in an ordinary vertical antenna and in a ground antenna, we can calculate the wave front angle since the electric intensity (volts per meter) must be proportional to the projection of the wave on the vertical and horizontal planes.[3] Observations have been made which show that an antenna 2000 feet long in fresh water receives the signals from Nauen at a wave length of 12,500 meters with the same intensity as a vertical antenna having an effective height of 50 feet, the resistance of the vertical antenna system being approximately 50 ohms and the water wire approximately 100 ohms.

Since the strength of the telephone currents is proportional to the square root of the antenna watts, the field expressed in volts per meter is twenty-eight times as strong in the vertical plane as in the horizontal, which would correspond to a deviation from the vertical of approximately 2°. This, it will be seen, lies within the estimated

[3] This method may perhaps be criticized on account of the unknown effects of the earth currents surrounding the ground antenna.

limits of error of the pivoted antenna measurements and the results of the two methods may be considered to agree.

We may therefore assume in conclusion that for wave lengths over 10,000 meters, the deviation of the wave front from the vertical under ordinary conditions at Anacostia does not much exceed three degrees.

Static

With the new apparatus it was possible to obtain the angle of the wave front of the static disturbances with considerable accuracy. It was found, contrary to the hypothesis that static comes from above, that the static wave front is always practically vertical like the signal, but that at times the two angles differ sufficiently to give a readable signal on the static minimum.

Preliminary observations in this work were taken by T. H. Willey, Electrician, U. S. N., while observations with the final apparatus were made by L. M. Clausing and W. F. McBride.

ZOOLOGY.—*The nomenclature of supergeneric names.*[1] S. A. ROHWER, Bureau of Entomology.

The recent article by Dr. Harry C. Oberholser[2] on the nomenclature of supergeneric[3] names is by far the most comprehensive treatment of the subject which has been published, and should form the basis for a discussion of the subject which will lead to the establishment of satisfactory rules covering this important question. The adoption, as a part of the International Code, of any comprehensive and uniform set of rules is most certainly to be accompanied by the change of many supergeneric names and the matter should be considered by students in all groups and an effort made to preserve as many of the best known names as possible.

Dr. Oberholser has made reference to the Hymenoptera at a number of different places in his article and it seems worth while to point out certain overlooked points and show how the rules which he recommends would work in certain groups within this order. On page 144 he implies that modern entomologists have endeavored to follow the plan of naming the family after the oldest included genus, and

[1] Received January 6, 1921.

[2] *The Nomenclature of Families and Subfamilies in Zoology.* Science, n. ser. **52**: 142–147. 1920.

[3] I have used this term because I wish to include superfamilies, families, subfamilies, tribes and subtribes.

apparently overlooks the fact that in the most recent catalogue of Hemiptera the author has been guided by the rule of priority in selecting family names. In the Hymenoptera there has been no fixed rule governing the selection of supergeneric names but by far the greater number of taxonomists have formed the names from the oldest included genus, and some of the most apparent exceptions which occur in recent catalogues are caused by the authors of these catalogues accepting only part of classifications or by their placing different values on certain supergeneric groups.

In his arguments for what he calls the "permanent type genus" rule, Dr. Oberholser advances the belief that for Hymenoptera Dalla Torre has catalogued all the family and subfamily names, and with this as a basis it would be comparatively simple to adopt this principle. This is hardly true, and when one contemplates adopting the law of priority for the selection of supergeneric names, he loses much of his enthusiasm as soon as he sees the labor and difficulties involved in cataloguing these names. Dalla Torre's "Catalogus Hymenoptorum" gives only a few of these. Supergeneric group names have been used not only in taxonomic papers but also in local and faunistic lists, catalogues of collections and in biological and anatomical papers. There has never been any serious effort made to index all these names, in fact many of the papers containing them are of such a local or ephemeral nature that only the titles are recorded. To adopt this principle would mean that we should have to go completely through the vast literature dealing with Hymenoptera and when this task was completed we should still be in doubt because of the possibility of overlooking papers. Such work would require considerable time and could only be done in large libraries. After such researches were completed it would be necessary to publish the results in full, so that in case other students should wish to subdivide existing groups, they would be able to determine if a name had ever been proposed for a similar group or a group containing some of the same genera as those they included in their unit. Of course it may be argued that it would not be necessary to catalogue all papers and that we should only include those which are purely systematic, but such a plan would be unsatisfactory because it would envolve a decision as to what was "systematic" and might eliminate such useful lists as those prepared for the various editions of the Insects of New Jersey.

From the above it might be understood that I do not favor the adoption of the method approved by Dr. Oberholser; and this is in a

large part true. The idea he defends is undoubtedly logical, it encourages and necessitates the study of the history of classification, but it is beset with certain practical difficulties. The application of the principle of priority would bring about some curious changes of which the following may serve as an example.

The genus *Bracon* is the type genus of the family Braconidae and should also be the type genus of all minor divisions of the family in which it is included. The application of the rule of priority and the other rules advanced by Dr. Oberholser would make this last impossible. Years ago the family was divided into subfamilies and these subfamilies were given names formed on the root of one of the generic names included. The students who proposed these names paid but little consideration to genotypes and their subfamily Braconinae was founded on their conception of the group *Bracon* rather than the genus of the genotype. The genus *Bracon* of the genotype belongs to a different subfamily, termed "Agathinae," which was proposed at the same time as the subfamily Braconinae. According to the law of priority the subfamily name Agathinae must hold for the group (because the name of its type genus (*Agathus*) remains unchanged) even though the genus *Bracon* is added to it; and the name of the old group Braconinae must be changed to Microbraconinae, and have as its type the generic name which replaces *Bracon* of authors (not the genotype). Perhaps the following summary will make this clearer:

Braconidae.

Braconinae Marshall, 1887 = Microbraconinae.
Type.—*Bracon* Auctt. nec Fabricius = MICROBRACON Ashmead.
Agathinae Marshall, 1887.
Type.—*Agathus* Latreille, 1805.
Includes—*Cremnops* Foerster, 1862 = BRACON Fabricius, 1804.

Hymenopterists have not followed the above but have formed the subfamily names on the oldest included genus and thus have a subfamily Braconinae in the family Braconidae. We call the Agathinae the Braconinae and the Braconinae of Marshall, Ashmead and others Vipiinae.

Other curious and unusual cases could be cited and it is practically certain that no set of rules could be made which would, without interpretation and emendation, cover all cases which will arise. There are numerous and difficult questions connected with the application of the rules governing generic names, many of which are not covered by the International Code, and when it is possible to have a method

of choosing supergeneric names which is definite and easily applied I fail to see the advantage of complicating matters by formulating numerous rules which will have to be interpreted or emended.

There has been such a lack of uniformity in forming supergeneric names that the application of any one method throughout Zoology would undoubtedly lead to many changes, and yet for the stability of such names we should make an earnest effort to reach a satisfactory "official" agreement as to methods of procedure. Because of the lack of a policy in the past I think we must digress from our usual method of procedure and adopt definite, although not necessarily the same, methods for all major groups. I believe that the International Commission would do well in appointing committees for all the major groups and that these committees should carefully review the literature of their groups and then recommend to the Commission a policy which would necessitate the fewest changes. After the Commission reviewed their report they should submit it, with recommendations, to all contemporary workers in the group. This would permit discussion. In the absence of objections an "official" opinion should be rendered. Cases where there was objection should be referred back to the committee for consideration and a revised report submitted which would follow the same procedure. After all the groups had been covered by opinions these should be formulated into rules and made a part of the Code.

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the editors. The abstracts should conform in length and general style to those appearing in this issue.

CERAMIC CHEMISTRY.—*Note on the mechanics of the weathering of glass.* F. RUSSELL V. BICHOWSKY. Journ. Amer. Ceramic Soc. **3:** 309–312. April, 1920. (Geophysical Lab., Papers on Optical Glass, No. 23*b*.)

The mechanism of the weathering of a glass surface by water is believed to consist of the following stages: (1) true adsorption; (2) diffusion of adsorbed water into the glass; (3) reaction with the silicates; (4) soaking up of more water by the film so produced; (5) extraction of the soluble salts; (6) solution of the silica skeleton. The appearance and behavior on heating of glasses in each of these stages are described. R. B. SOSMAN.

CERAMIC CHEMISTRY.—*A practical test of the resistance of optical glass to weathering.* F. RUSSELL V. BICHOWSKY. Journ. Amer. Ceramic Soc. **3:** 296–304. April, 1920. (Geophysical Lab., Papers on Optical Glass, No. 23*a*.)

The experiments described in this paper were made in 1917 with the object of getting a rapid routine method for testing the weather stability of the optical glasses then being made for military purposes. The surface alkali test described by Mylius was used, but its indications are not certain for all types of glasses. Methods of determining the rate of solubility in water, ammonia, or hydrochloric acid were also tried, but were not found adaptable for routine procedures. The tests finally adopted consisted in heating samples of the glass, in company with a standard glass, in water, 5 per cent sodium hydroxide, and 1:1 hydrochloric acid, at temperatures of 175° or 225° C. The glasses could then be classified into 9 groups according to their appearance when wet and when dry, although there is sometimes considerable difference in the order of stability found with the three reagents used. The safest estimate is one based on the three tests taken as a group. R. B. SOSMAN.

CERAMICS.—*The manufacture and uses of rolled optical glass.* H. S. ROBERTS and J. C. HOSTETTER. Journ. Amer. Ceramic Soc. **3:** 750–761. Sept., 1920. (Geophysical Lab., Papers on Optical Glass, No. 24.)

Rolled optical glass is manufactured by a process combining the stirring and earlier processes used for ordinary optical glass, with the casting and subsequent processes ordinarily used in the manufacture of rolled plate glass. The glass obtained is characterized by the presence of striae in the form of plane, parallel films, which are in general invisible unless viewed edgewise. Optical systems manufactured from rolled glass should therefore be designed so that the path of light rays cuts the striations in a direction that is as nearly as possible normal to the direction of the striations themselves. The methods of manufacture and inspection are described and a discussion given of the manner of forming the glass into blanks for lenses and prisms. J. C. H.

INORGANIC CHEMISTRY.—*The binary system åkermanite-gehlenite.* J. B. FERGUSON and A. F. BUDDINGTON. Amer. Journ. Sci. IV. **50:** 131–140. 1920.

The binary system åkermanite ($2CaO.MgO.2SiO_2$)-gehlenite ($2CaO.Al_2O_3.SiO_2$) was studied by the quenching method and the solidus and liquidus curves determined. The system forms a complete series of solid solutions with a minimum melting point about 70° below the melting point of åkermanite, the component of lower melting point, at a composition of about 74 per cent åkermanite and 26 per cent gehlenite. Åkermanite was found to show the unusual feature of its glass having a greater density than the corresponding crystals at 25° C. The optical characters of the crystals are a continuous function of the composition. Åkermanite is positive in its optical characters and gehlenite is negative. Crystals of certain intermediate compositions are isotropic for light of a definite wave length and constitute a transition phase between positive and negative crystals.

A. F. B.

ORNITHOLOGY.—*Some notes on the plumage of the male Florida Redwing (Agelaius p. floridanus).* F. C. LINCOLN. Proc. Biol. Soc. Wash. **32:** 196–197. 1919.

A considerable number of non-breeding males of *Agelaius phoeniceus floridanus* were found in Louisiana in June. These birds, though at least a year old, showed clear evidence of immaturity on their obscured or dull-colored orange shoulder patches, and in many cases also in the much less brilliant color of other parts of the plumage, particularly of the black body areas. It would be interesting to know whether this condition is common to all the subspecies of *Agelaius phoeniceus.*

HARRY C. OBERHOLSER.

ORNITHOLOGY.—*The relationships and geographical distribution of the species and races belonging to the genus Rhynchocyclus.* CHARLES B. CORY. Proc. Biol. Soc. Wash. **32:** 217–224. 1919.

A synoptical revision of the tyrannine genus *Rhynchocyclus* results in the recognition of twenty forms, all of which have been hitherto described. Of *Rhynchocyclus sulphurescens,* six forms prove to be valid; of *Rhynchocyclus cinereiceps,* two; of *Rhynchocyclus peruvianus,* two; of *Rhynchocyclus marginatus,* two; of *Rhynchocyclus megacephalus,* one; of *Rhynchocyclus poliocephalus,* three; of *Rhynchocyclus grisescens,* one; and of *Rhynchocyclus flaviventris,* three. Comparison also shows that *Rhynchocyclus sulphurescens pallescens* Hartert and Goodson is a synonym of *Rhynchocyclus sulphurescens* (Spix); and *Rhynchocyclus sulphurescens asemus* Bangs is a subspecies of *Rhynchocyclus cinereiceps* rather than of *Rhynchocyclus sulphurescens.*

HARRY C. OBERHOLSER.

ORNITHOLOGY.—*Descriptions of proposed new birds from Peru, Bolivia, Brazil, and Colombia.* FRANK M. CHAPMAN. Proc. Biol. Soc. Wash. **32:** 253–268. 1919.

Further study of collections of birds from South American has resulted in the discovery of a number of birds new to science. Among these is a new genus of Furnariidae most closely allied to *Automolus* and here named *Hylocryptus.* The following new species and subspecies are also described:

Micropus peruvianus from Ollantaytambo, Peru; *Grallaria watkinsi* from Milagros, Province of Piura, Peru; *Grallaricula boliviana* from Incachaca, Province of Cochabamba, Bolivia; *Synallaxis stictothorax piurae* from Chilaco, near Samate on the Rio Chira, Province of Piura, Peru; *Phacellodomus striaticeps griseipectus* from Tica-Tica, near Cuzco, Peru; *Hylocryptus erythrocephalus* from Alamor, Peruvian-Ecuador boundary; *Xenops rutilus connectens* from Todos Santos, Province of Cochabamba, Bolivia; *Xiphorhynchus triangularis bangsi* from Yungas, Province of Cochabamba, Bolivia; *Thripobrotus layardi madeirae* from Porto Velho, Rio Maderia, Brazil; *Thripobrotus warscewiczi bolivianus* from Incachaca, Province of Cochabamba, Bolivia; *Mecocerculus subtropicalis* from San Miguel Bridge, Urubamba Cañon, Peru; *Anaeretes agraphia* from Idma, near Santa Ana, Peru; *Mionectes striaticollis columbianus* from Santa Elena, Antioquia, Colombia; *Myioborus melanocephalus bolivianus* from Incachaca, Province of Cochabamba, Bolivia; *Basileuterus luteoviridis supercilaris* from above Torontoy, Urubamba Cañon, Peru; *Pheuticus uropygialis terminalis* from San Miguel Bridge, Urubamba Cañon, Peru; and *Catamenia analoides griseiventris* from Cuzco, Peru. HARRY C. OBERHOLSER.

ORNITHOLOGY.—*Mutanda ornithologica. VIII.* HARRY C. OBERHOLSER. Proc. Biol. Soc. Wash. **32**: 239–240. 1919.

Recent investigations show that *Pitta atricapilla* Lesson, being antedated by *Turdus sordidus* Müller, must now be called *Pitta sordida* Müller. The name of the swallow now known as *Riparia paludicola sinensis* (Jerdan) is preoccupied and must be changed to *Riparia paludicola chinensis* (Gray). For the same reason *Stoporala melanops* (Vigors) must become *Stoporala thassina* (Swainson). Similarly, *Hemipus obscurus* (Horsfield) should stand as *Hemipus hirundinaceus* (Temminck). The South American tanager commonly called *Tachyphonus rufiventris* (Spix) must be rechristened, since its present name is invalidated, and it now may be known as *Tachyphonus metallactus*. H. C. O.

ORNITHOLOGY.—*An unrecognized subspecies of* Melanerpes erythrocephalus. HARRY C. OBERHOLSER. Canadian Field Nat. **33**: 48–50. 1919.

The red-headed woodpeckers inhabiting the Great Plains and Rocky Mountain region of the United States and southern Canada differ from those of the eastern United States in decidedly larger size and usually more reddish posterior lower parts. These differences entitle it to subspecific recognition, and it may be known as *Melanerpes erythrocephalus erythrophthalmus* Silloway. H. C. O.

ORNITHOLOGY.—*An all-day bird trip at Washington, D. C.* HARRY C. OBERHOLSER. Amer. Midl. Nat. **6**: 103–110. 1919.

An all-day trip in the vicinity of Washington, D. C., on May 13, 1907, furnished data on the unusually large number of 103 species and subspecies of birds. A few species, such as *Colaptes auratus auratus, Penthestes carolinensis carolinensis,* and *Vireo griseus griseus,* were more than ordinarily numerous on this occasion. Two ducks, *Clangula clangula americana* and *Dafila acuta tzitzihoa,* were noted later in the spring than ever before in this region. H. C. O.

ORNITHOLOGY.—*The migration of North American birds. XI. Canada Jay, Oregon Jay, Clarke's Nutcracker, and Piñon Jay.* HARRY C. OBERHOLSER. Bird Lore **21:** 354–355. 1919.

From data chiefly in the United States Biological Survey the geographic distribution and movements of four species of Icteridae have been determined. Five subspecies of *Perisoreus canadensis* are recognized, including the recently described *Perisoreus canadensis sanfordi* and three forms of *Perisoreus obscurus*, including *Perisoreus obscurus rathbuni*. Data on *Nucifraga columbiana* and *Cyanocephalus cyanocephalus* are also given.

H. C. O.

PHYSICAL CHEMISTRY.—*Estimating impurities by means of the melting point curve.* W. P. WHITE. Journ. Phys. Chem. **24:** 393–416. 1920.

Freezing points where the thermometer is immersed in the substance are more reliable and precise than those by the capillary tube method. If in addition the form of the freezing curve is observed, there is obtained an indication of the amount of impurity, which is independent of all previous knowledge or uncertainty as to the melting point of the pure substance, and even of the absolute accuracy of the observer's thermometer.

Smallness of dimensions diminishes local temperature differences, and is very often a superior substitute for stirring of the tested substance. It also economizes both time and material. The complications, usually almost negligible, arising from specific heat, uneven temperature, and other causes are considered, and suitable experimental arrangements are suggested.

W. P. W.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

WASHINGTON ACADEMY OF SCIENCES

150TH MEETING

The 150th meeting was held in the Assembly Hall of the Cosmos Club on Thursday, November 18, 1920. Dr. ELMER D. MERRILL, Director of the Bureau of Science, Manila, P. I., delivered a popular lecture, *Man and nature in the Philippines*, illustrated by lantern slides.

From an ethnological standpoint the Filipino people include three distinct types: the primitive negrito, who were undoubtedly the original inhabitants of the archipelago; the proto-Malayan or Indonesian, representing the first invaders; and the Malayan, now numerically and economically the most important element in the native population, comprising the so-called Christian Filipinos and the Mohammedan peoples of Mindanao and the Sulu Archipelago. At the present time more than 40 different languages are spoken in the Archipelago. The language distribution was indicated by a colored lantern slide. Types of many of the different tribes were shown also, and brief notes given regarding them.

In connection with a relief map shown, the essentially mountainous character of the Archipelago was discussed, and some of the more important volcanos were illustrated. The three different types of climate (the constantly wet regions, those having alternating wet and dry seasons, and others of an intermediate type) were similarly indicated, and the causes discussed: the northeast monsoon, the southwest trades, the typhoons, and the topography. The effects of climate on plant distribution were noted, particularly as delimiting rather strongly the distribution of the major agricultural crops, such as sugar, abaca or manila hemp, coconuts, and tobacco. Types of vegetation were shown and briefly discussed: the virgin forest, secondary forests, open grass lands, and settled areas. The indications are that the original vegetation was a continuous virgin forest of one type or another, and that primitive man through his destructive methods of clearing land by felling trees and burning, and then after one or two seasons moving on to a new clearing, was largely responsible for the vast areas of open grass lands and second-growth forests now so characteristic of many parts of the Archipelago.

Brief notes were given also regarding the extent of the flora and concerning its special relationship, which is distinctly with Celebes and the Moluccas, New Guinea, and northeastern Australia. Bornean elements are few and practically fail to reach the Archipelago proper, nor are there any notable special alliances with the Sunda Islands and the Malay Peninsula. The conchology, entomology, ornithology, ichthyology, and general zoology of the Philippines were briefly mentioned, with an indication of the enormous development in species in the first two groups. From a geological standpoint the islands are comparatively recent. This is reflected in the present fauna and flora, the latter in particular being notably rich in endemic species but poor in endemic genera.

In conclusion the speaker gave an interesting account of the Bureau of Science and its work.

151ST MEETING

The 151st meeting was held jointly with the Botanical Society of Washington in the Assembly Hall of the Cosmos Club on Thursday, December 16, 1920. Prof. H. M. HALL, of the Carnegie Institution of Washington, delivered an illustrated address, entitled, *Hay fever in its specific botanical relationships*, based upon studies carried out for a number of years in the Rocky Mountain and Pacific coast states in cooperation with certain physicians and specialists, especially Dr. Grant Selfridge, of San Francisco.

Hay fever attacks about one per cent of the population of the United States. It is not due simply to a local irritation, but to a general poisoning by toxic albumins, derived usually from the pollens of various plants. The conditions of attack are three: (1) a defective mucous membrane, permitting the poison to gain access to the circulation; (2) a blood serum lacking in anti bodies; (3) the presence of poisonous pollens in the atmosphere.

A simple nasal operation frequently relieves the first-named condition. The second is less accessible to treatment but may be remedied by the injection of solutions prepared from specific pollens. The third condition is one to which practically everyone is exposed in the spring, summer, and fall, since pollen is then extremely abundant in the atmosphere. Individuals are more exposed to plant pollens than to any other nitrogenous substance, with the exception of the food in the alimentary tract.

Most plants do not cause hay fever, chiefly for the reason that they do not produce wind-borne pollen. For example, of 1600 species of flowering plants in the District of Columbia perhaps 300 are wind-pollinated. About 190 of the latter are grasses. Only about 50 are really abundant, and therefore to be considered first in a "hay fever survey."

Many misconceptions have grown up regarding the sources of hay fever. The spring type, often known as "rose cold," has no connection whatever with roses. The common goldenrod is never known to cause hay fever, as it produces very little pollen. It does, however, in common with many other plants, carry on its surface considerable quantities of pollens that produce hay fever, such as that of the ragweed. Pines produce abundant pollen but do not cause hay fever.

Plants are tested for their capacity to produce hay fever, first, by the botanical method, as above noted, and second, by the injection of a pollen extract into the skin. If the patient is susceptible to poisoning by a given pollen a swelling and reddening are observed around the spot where the extract has been injected.

The principal causes of spring hay fever are grasses, poplars and cottonwoods, oaks, various nut-bearing trees (such as the black walnut, which is a common source in the Sacramento Valley), the cultivated sycamore, the Chenopodiaceae, and the plantains. In the late summer and autumn the principal causes are ragweeds and other members of the ragweed tribe, the artemisias, and some of the Chenopodiaceae.

Successful treatment of hay fever depends upon close cooperation between the physician, the botanist, and the laboratory technician. The possible sources of infection in a given district must first be outlined by the botanist. Pollen preparations are then made in the laboratory and these are used by the physician in finding out to what pollens the patient is sensitive. Injections of dilute solutions of the specific causative pollens and of no others, increasing from 1: 300,000 up to as high as 1: 1,000 or even higher, can then be given before the hay fever season, and produce immunity for at least one

season, and possibly longer. It would be entirely feasible to eliminate completely hay fever from the United States, but the rational carrying out of a program toward this end is being seriously jeopardized by the manufacture and sale of various hastily made and ill-selected pollen preparations which are doing a great deal of harm by shaking the confidence of physicians and the public; such nostrums are advertised even in reputable scientific magazines. It is greatly to be desired that reputable and reliable drug manufacturing firms should take up the problem seriously in cooperation with botanists of standing, so that dependable preparations may be made available to physicians.

152D MEETING

The 152d meeting of the Academy, the 23d annual meeting, was held at the Administration Building of the Carnegie Institution of Washington, on Tuesday, January 11, 1921. The meeting was called to order by Vice-President F. V. COVILLE. Dr. J. R. JOHNSTON, Chief of the Office of Plant Sanitation, Cuba, and Director of Research for the United Fruit Company, delivered an address on *Some problems in economic biology in tropical America.*

The activities of the Office of Plant Sanitation, Cuba, begun in 1916, were discussed briefly as including plant quarantine, disease and insect control work, and port, railway, and nursery inspection. The investigational work is carried out at the Estacion Experimental, Santiago de las Vegas. Instruction is given in a recently instituted course of plant pathology in the University of Havana. The presence of a considerable force of field inspectors throughout the island gives excellent opportunities for discovering new pests and diseases, new facts about them, and new investigational data regarding the old ones.

Special attention is being given to coconut budrot, control of the citrus black fly, and to investigation and control of the sugar cane mosaic disease.

The several types of budrot and their bacterial and fungoid origin were discussed at length. Although progress is being made in combating disease, losses caused by it in the American tropics as a whole are enormous. At the present time spraying, cutting down and burning infected trees, and replanting are the most practical methods of control. Progress might conceivably be made by introduction of the disease-resistant varieties, a course which is being undertaken in Panama.

The coconut suffers also from the "red ring" disease, characterized by a dark red ring seen in the trunk in cross-section. The discolored tissues are found to be full of nematodes. This disease, first described from Trinidad and Grenada, is known also from Cuba and Central America, and is apparently widespread. It is especially destructive in Trinidad, but neither here nor elsewhere has any satisfactory method of control been worked out. Plantations on hilly regions are apparently free from this disease, which is found in its most acute form in drained lowlands.

Hardly second in destructiveness to any other known plant disease is the so-called "banana wilt," caused by *Fusarium cubense.* This is widespread in tropical America and occurs in many regions of the Old World also. Sanitary measures have almost no appreciable effect, and the disease has progressed rapidly and caused enormous losses. Certain varieties of bananas are highly resistant. The propagation of these seems to offer the most likely solution.

The mosaic disease of sugar cane and the control of the citrus black fly were discussed, the difficulties of the latter work being especially emphasized.

Many organizations are carrying out elaborate investigations of cane varieties, and deep regret was expressed by the speaker that similar work was not being conducted on a large scale in the case of the coconut and banana, since these two crops afford the most important pathological problems of economic botany in all tropical America. Considering the huge investments of American capital and the large part tropical foodstuffs play in our national food supply, the speaker deprecated strongly the lack of vital interest in the problems of the tropics and the disinclination of many American scientists to undertake investigations in this interesting and all-important field of work.

Following the address a business meeting was held. The Corresponding Secretary, ROBERT B. SOSMAN, reported that the membership remained at 541, consisting of 6 honorary members, 3 patrons, and 532 members, one of whom is a life member. Of this number, 330 reside in or near the District of Columbia. Twenty-two resignations were accepted during the year, 16 of these being of non-resident members. The members who died during the year are: JOHN ALFRED BRASHEAR, ALBERT HUGH BRYAN, ROBERT HOLLISTER CHAPMAN, ARTHUR J. ELLIS, WALTER FAXON, WILLIAM CRAWFORD GORGAS, HENNEN JENNINGS, HARMON NORTHROP MORSE, CEPHAS HEMPSTONE SINCLAIR.

The Corresponding Secretary reported also on the activities of the Academy during 1920. These were largely centered in the continued publication of the *Journal*, but included assistance in several other projects of practical value, such as the classification of the scientific and technical employees in the Federal service, as well as matters of local educational interest.

The Recording Secretary, WILLIAM R. MAXON, reported briefly upon the thirteen public meetings held during the year, at which illustrated lectures were delivered. These covered a wide range of subjects and were well attended.

The report of the Treasurer, R. L. FARIS, showed total receipts of $5,829.73 and total disbursements of $5,515.38, the cash balance on hand being $1,792.62. The investments of the Academy have a total par value of $15,036.37. The cost of printing the *Journal* in 1920 was $2,873.74 as against $2,550 for 1919. A further increase in unavoidable in 1921.

The report of the Auditing Committee, consisting of E. D. WILLIAMSON, B. L. JOHNSON and H. C. OBERHOLSER, was read, and the reports of the Treasurer and Auditing Committee were accepted.

The report of the Editors of the Journal was read by J. FRANKLIN MEYER, the senior editor.

The committee of tellers, consisting of N. L. BOWEN, W. F. MEGGERS and R. B. SOSMAN, reported that the following officers had been elected for 1921: *President*, ALFRED H. BROOKS; *Corresponding Secretary*, ROBERT B. SOSMAN; *Recording Secretary*, WILLIAM R. MAXON; *Treasurer*, R. L. FARIS; *Non-resident Vice-Presidents*, J. MCKEEN CATTELL, E. B. WILSON; *Members of Board of Managers, Class of 1924*, H. S. GRAVES, SIDNEY PAIGE.

The following *Vice-Presidents* nominated by the affiliated Societies were then elected: *Archaeological Society*, ALES HRDLICKA; *Biological Society*, NED HOLLISTER; *Botanical Society*, A. S. HITCHCOCK; *Chemical Society*, WILLIAM BLUM; *Institute of Electrical Engineers*, F. B. SILSBEE; *Society of Engineers*, R. L. FARIS; *Entomological Society*, S. A. ROHWER; *Society of Foresters*, RAPHAEL ZON; *National Geographic Society*, FREDERICK V. COVILLE; *Geological Society*, DAVID WHITE; *Historical Society*, ALLEN C. CLARK; *Philosophical Society*, W. J. HUMPHREYS.

WILLIAM R. MAXON, *Recording Secretary.*

BOTANICAL SOCIETY

145TH MEETING

The 145th regular meeting of the Botanical Society of Washington was held at the Cosmos Club, 8 p. m., October 5, 1920. Thirty-three members and one guest were present.

Mr. ALBERT A. HANSEN gave an illustrated talk on *Our disappearing wild plants*. He explained that although the transition which our flora is undergoing is attributable to some extent to such unavoidable causes as lumbering, building, the cultivation of new land and grazing, the greatest damage is due to avoidable causes, such as the promiscuous gathering of wild flowers by thoughtless pickers and the commercial exploitation of the wild flora. He also referred to the educational methods used by the Wild Flower Preservation Society of America to create a strong sentiment in favor of protecting our handsome wild plants. Among the plants needing protection are columbine, arbutus, pitcher plants, ground pine, flowering dogwood, rhododendron, and several lilies and orchids.

20TH ANNUAL MEETING

The 20th annual meeting of the Botanical Society of Washington was held at the Cosmos Club, October 5, 1920. The following officers were elected for the ensuing year: President, CHAS. E. CHAMBLISS; Vice-President, P. L. RICKER; Recording Secretary, ROY G. PIERCE; Corresponding Secretary, R. KENT BEATTIE; Treasurer, L. L. HARTER. Prof. A. S. HITCHCOCK was nominated for Vice-President in the Washington Academy of Sciences.

CHARLES E. CHAMBLISS, *Recording Secretary.*

146TH MEETING

The 146th meeting of the Society was held at the Cosmos Club on November 2, 1920, 62 members and guests being present, and the President, Mr. CHARLES E. CHAMBLISS, in the chair.

Under *Brief Notes* Dr. A. S. HITCHCOCK spoke of the valuable collection of South American grasses just received by the National Herbarium from Germany. The program was as follows:

W. E. SAFFORD: *The first Pan-Pacific Scientific Conference* (illustrated).

This conference, at which Dr. Safford was a delegate from the U. S. Department of Agriculture, was held at Honolulu, August 2 to August 20, 1920. Delegates were present from the United States, British Columbia, Hawaii, New Zealand, Australia, New South Wales, the Philippine Islands, and Japan.

The scope of the topics discussed was very wide, embracing a discussion of most of the physical and biological phenomena of the Pacific. The sessions of the Conference were interrupted by a visit to the active volcano of Kilauea and an excursion around the west coast of the island of Hawaii.

As a result of the conference, a number of resolutions were presented by the various sections, among them the following:

That any agency created for the guidance of scientific research and exploration in the Pacific region should be affiliated with the International Research Council; that the attention of Governments be invited to the desirability of providing vessels for suitably planned expeditions of scientific research, similar in character to the Wilkes and the Challenger expeditions; that young men and women should be trained for scientific work and that such work be adequately compensated. Other resolutions bore upon the

desirability of studying the anthropology of Pacific races, the making of a magnetic, geographical, physical and biological survey of the Pacific Ocean, including a study of bottom samples, brachiopod faunas as an index to former land connections, algae, ecology of corals on coral reefs, land faunas of Pacific islands, and the relation of living forms to extinct allied forms, Pacific birds, land flora including problems of forestry, agriculture, ethnobotany, plant ecology on oceanic islands and on new lava flows and ash deposits from volcanic ejections, the preservation of the Hillebrand garden at Honolulu; also the establishment of a meteorological station on Mauna Loa; the study of volcano and earthquake phenomena, and the publication of information relating to them; and the continuation of the geophysical observatory at Samoa.

SAMUEL B. DETWILER: *White pine and the blister rust* (illustrated with motion pictures and accompanied by specimens).

The white pine is probably the best known timber tree in the country, and up to 1880 produced the bulk of the country's lumber cut. In the East most of the white pine had been removed by 1890, and the present lumber cut in New York, Pennsylvania, Michigan and Wisconsin is only a small fraction of what it was formerly. In New England, however, because of the ability of this species to restock abandoned lands, the white pine has held its own.

The blister rust infection is heaviest in New England and eastern New York. This disease, as far as is known, has not crossed the Great Plains and infected the very valuable sugar pine and western white pine forests. While there are federal and state quarantines, prohibiting the shipment of five-leaf pines and Ribes (currants and gooseberries) from the East to the West, yet there have been numerous violations of these quarantines, any one of which, had it not been caught, might have carried the blister rust to the western forests. The Dominion of Canada is cooperating with the United States in trying to protect the West and has adopted quarantines similar to ours. These quarantine measures will, however, break down unless adequate inspection is made to prevent violations. That our western white pines are subject to infection from blister rust is borne out by recent letters from Mr. WM. S. MOIR who is studying the blister rust in Europe for the United States Department of Agriculture. He has found not only the eastern white pine heavily infected, but also the limber pine, sugar pine and western white pine.

The blister rust infection on white pine in the East is increasing rapidly. A strip survey in New Hampshire showed 26 per cent of the pines infected on an area of 72 square miles. A similar strip, studied in New York, showed 10 per cent of the pines infected.

Protective measures in the East consist of the destruction of the alternate hosts of the blister rust, currants and gooseberries, both wild and cultivated. In 1919, over 250,000 acres were cleared of Ribes in the North East. The average labor cost per acre in New England was 24 cents; in New England and New York, 42 cents, and with supervision 54 cents. Experience has shown that the Ribes eradication crews destroyed over 95 per cent of the bushes in one working, and that the leaf surface destroyed is over 99 per cent. Chemical eradication of Ribes is being tried out and has proven quite successful. An ecological study of currants and gooseberries, which is being carried on, is expected to further reduce the cost of eradication.

147TH MEETING

The 147th meeting was held in the Assembly Hall of the Cosmos Club, December 7, 1920, with 56 members and 10 guests present, and President

CHAMBLISS in the chair. JAMES M. R. ADAMS, SAMUEL B. DETWILER, HARRY T. EDWARDS, PETER KLAPHAAK, and FREDERICK D. RICHEY were elected into the Society. The names of WM. DIEHL, Dr. J. F. MARTIN, Dr. EBEN H. TOOLE and Mr. FREEMAN WEISS were presented as candidates for membership.

Under *Brief notes and reviews of literature*, Dr. HAVEN METCALF presented two books as worthy of the study of any scientist. The first is by Émile Duclaux, entitled *Pasteur, Histoire d'un Esprit*, and published in 1896. This book has been translated into English by Dr. ERWIN F. SMITH and Miss FLORENCE HEDGES under the title of *Pasteur, History of a Mind* (published by the W. B. Saunders Co., in 1920). Dr. E. D. MERRILL called attention to two of his publications which were little known, one entitled *A Commentary on Loureiro's Flora Cochinchinensis*, in 2 volumes, typewritten in 1919. But 5 copies were issued, one of which is in the Library of the U. S. Department of Agriculture. The second, *Species Blancoanae*, a critical revision of the Philippine species of plants described by Blanco and Danos, was put out in Manila in typewritten form in 1917. This work is also in the Library of the U. S. Department of Agriculture.

Regular Program

E. D. MERRILL: *Vegetation of the Philippines* (illustrated by lantern slides).

The salient features of the Philippine flora were discussed, and so far as possible the points were illustrated. The known flora comprises about 8500 species of phanerogams and nearly 1000 species of ferns and fern allies, while, excepting the algae, the various groups of cellular cryptogams are relatively highly developed. The percentage of specific endemism is high, over 60 per cent, while generic endemism is very small, indicating a separation from other parts of Malaya sufficiently long to allow the development of very numerous local species, but not long enough to permit the development of many genera. The Archipelago presents Asiatic, Malayan, Australian, and Polynesian elements, but its flora is essentially Malayan. The continental elements are practically confined to the mountains of northern Luzon; the Polynesian and rather striking Australian elements are nowhere dominant, but occur at both low and high altitudes. While the Philippine flora is essentially Malayan, there are practically no special alliances with Borneo, Sumatra, Java, and the Malay Peninsula, but there are very striking special alliances with the islands to the south and southeast, Celebes, the Moluccas, New Guinea, tropical Australia, and New Caledonia. The indications are that the original Philippine flora came largely from the islands to the south and southeast, not from the Sunda Islands to the southwest. It would seem probably that an ancient continent extended from the Philippines to the south and southeast at least as far as New Guinea, and that the plant migration followed what may have been a coastal plain region to what is now the Philippine Archipelago.

The various types of vegetation in the Philippines were discussed in detail, the virgin forest, secondary forest, and open grass lands. It was assumed that the original vegetation was a virgin forest of one type or another, and that the secondary forests and open grass lands, as well as the cultivated areas, are due to the activities of man. A cleared area once deserted almost never reverts to primary forest, but to open grass lands, bamboo thickets or secondary forests. Specific endemism in primary forests runs as high as 70 per cent, while in secondary forests, open grass lands, and settled areas it is

but about 7 per cent. It would seem that very many of the species of wide geographic distribution now characteristic of regions outside of the virgin forest, had been introduced into the Archipelago by one means or another, after the activities of man in the Archipelago had prepared regions suitable to their growth.

This paper was briefly discussed by several members.

The program was followed by a social hour with refreshments.

A joint meeting was held with the Washington Academy of Sciences on December 11, at which Dr. H. M. HALL of the Carnegie Institute spoke on *Hay fever and its specific botanical relationships*.

148TH MEETING

The 148th meeting was held in the Assembly Hall of the Cosmos Club on January 4, 1921, with 50 members and 7 guests present, and President CHAMBLISS in the chair. The minutes of the last meeting were read and approved. Mr. WILLIAM W. DIEHL, Dr. JAMES F. MARTIN, Dr. EBEN H. TOOLE, and Mr. FREEMAN WEISS, all of the Bureau of Plant Industry, were elected to membership. The executive committee presented the name of Mr. JOSEPH W. WELLINGTON as candidate for membership. President CHAMBLISS announced the meeting of the Washington Academy of Sciences on January 11, to which the members of the Botanical Society were cordially invited.

Brief reports were made by Dr. A. S. HITCHCOCK, Prof. C. V. PIPER, and Dr. W. H. WESTON on the Chicago meetings of the Association for the Advancement of Science, with particular reference to systematic botany, agronomy and pathology.

F. LAMSON-SCRIBNER: *The lure of Rock Creek Park* (illustrated by lantern slides).

Rock Creek Park in the District of Columbia, embracing over 1600 acres and extending for between 4 and 5 miles along both sides of Rock Creek, is wild and interesting. Much of it is unchanged from pre-Colonial days. Since picking flowers and plants is prohibited in the park, it is a real plant preserve, and a pleasure to all lovers of wild flowers. About 800, or one half of the species of flowering plants and ferns listed in the latest "Flora of the District and Vicinity," may be found within the park.

At one point in the creek bottom are large boulders that show remarkable pot holes, worn in the rocks by the action of water centuries ago. In the cool shaded ravines are found the maidenhair fern, with jack-in-the-pulpit, false solomon seal and bellwort; where the soil is rich and the trees less dense, the black snakeroot and *Astilbe* or false goats beard occur. One of the very first flowers in the spring is the hepatica.

Farther north we pass Joaquin Milier's picturesque log cabin. This cabin was formerly located at 16th Street above Florida Avenue and was moved to its present site in 1911. A number of fine springs are located in the park, which offer deliciously cool water to those who know where to find them.

The Park that presents so many, so varied and so beautiful and natural attractions in the summer season, offers hardly less beautiful scenes when the winter snows are on the ground and the trees and shrubs are festooned with crystal whiteness.

The paper was discussed by Dr. PAUL BARTSCH.

J. MARION SHULL: *Skunk cabbage*, Spathyema foetida (with lantern). The skunk cabbage pursues for an indefinite number of years a monopodial juvenile existence until such time as the terminal bud becomes modified to

produce the first inflorescence, after which the growth becomes sympodial and so continues to a possible extreme and indefinite old age. The sympodial stage is characterized by a succession shoot of but two leaves. In the axil of the first of these leaves a bud lies dormant and is rarely permitted to develop further. The terminal bud being converted into an inflorescence, it thus devolves upon the second axillary bud to produce the new terminal and in its turn bear its leaves and surmounting spathe. Barring accident this succession continues ad infinitum. The leaf arrangement, which has always been in question, is difficult to trace, but elongated growths appear from deep seated lateral buds showing a close approximation to the familiar 2/5 cycle.

Balance between photosynthesis and fruit production is maintained by the regular suppression of most of the inflorescence, this abortion being apparently brought about through strangulation due to growth pressure of the leaf bases.

Contrary to popular opinion the spathe is not of rapid development, dissections showing that it is differentiated as much as twenty-seven months in advance of anthesis. There is no means of determining the age of an individual skunk cabbage, and there is no apparent reason why this plant may not outlive the oldest of the oaks.

R. G. PIERCE, *Recording Secretary.*

SCIENTIFIC NOTES AND NEWS

To aid in the rehabilitation of the library of the Department of Botany, Alabama Polytechnic Institute, Auburn, Alabama, which was destroyed by fire on October 17, 1920, the Smithsonian Institution, at the request of Prof. WRIGHT A. GARDNER, has undertaken to receive and forward to the Institute such publications as botanists and others in the vicinity of Washington may desire to present for that purpose. All packages should be plainly marked "Library, Department of Botany, Alabama Polytechnic Institute, Auburn, Alabama," and delivered to the Smithsonian Institution, charges paid.

The Washington Chapter of the American Association of Engineers has begun the publication of a monthly news organ under the title of *The Washington Engineer*. A. D. MOREHOUSE is editor and THOMAS H. FARIS associate editor of the new publication.

The Division of Graphic Arts of the National Museum has just received from the American Museum of Natural History in New York fifty specimens of metal movable type made from the fifty original bronze type which were cast in Seoul, Korea, about 1406, and were owned by the Government Printing Office. There seems to be little doubt that the credit for making the first movable metal type belongs to Korea, as Gutenberg did not start his press in Europe until about fifty years later. There was a movable clay type in China about two hundred years earlier.

The Pick and Hammer Club met on Saturday, January 29, at the Geological Survey. Talks were given by F. H. MOFFIT on *Some of the features of the problem of making maps from aeroplane photographs*; H. B. SULLIVAN, on *Some difficulties attending the practical application of aerial photography to mapping, from the viewpoint of the pilot of the observation plane*; and W. T. LEE, on *A look forward—the use of aeroplane photography in geology*.

The Section of Vertebrate Paleontology of the National Museum has received as a gift from the Southern Coal, Coke and Mining Company of Shiloh, Illinois, a beautifully preserved specimen of the extinct Carboniferous shark *Edestus heinrichsi*. It was found by one of the miners.

The Bureau of Standards announces a new method for producing very small and light mirrors for use on oscillographs and similar apparatus. These mirrors can be made in dimensions as small as 1.5 by 0.5 by 0.1 mm., and of satisfactory planeness and polish, by compressing aluminum between optically flat steel dies.

Mr. J. W. GIDLEY, Assistant Curator of Vertebrate Paleontology at the National Museum, left Washington in January for a two months' exploratory trip in Arizona, California, and Nebraska for the U. S. Geological Survey and to secure fossil mammals for the Museum collection. Important finds of Pleistocene mammal remains in the vicinity of Benson, Arizona, have already been made.

Mr. GEORGE L. HARRINGTON recently returned from South America, where he had been engaged for ten months in private work, and resumed work in the Alaskan Division of the U. S. Geological Survey. He went back to South America early in February.

Mr. HERBERT INSLEY has been transferred from the U. S. Geological Survey to the Bureau of Mines as petrographer. He will conduct petrographic studies of dust in metal mines and related petrographic problems at the experiment station of the Bureau at Pittsburgh.

Mr. EDWIN KIRK, who resigned from the U. S. Geological Survey in April, 1920, to do private work in South America, has been reinstated as geologist with the Survey.

Mr. J. C. MARTIN has resigned his position in the Foreign Mineral Section of the U. S. Geological Survey, and will go into private work in oil geology.

Mr. HOMER F. STALEY, metallurgical ceramist at the Bureau of Standards, resigned in December to become ceramic engineer with the Metal and Thermit Corporation, 120 Broadway, New York City.

Mr. EUGENE STEBINGER, formerly in charge of the Foreign Mineral Section of the U. S. Geological Survey, has resigned to engage in private work.

Dr. F. A. WOLFF of the Bureau of Standards gave a lecture before the City Club on January 26 on *A scientific analysis of Federal expenditures.*